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Assessing methods for developing crop forecasting in the Iberian Peninsula

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Abstract:

Seasonal climate prediction may allow predicting crop yield to reduce the vulnerability of agricultural production to climate variability and its extremes. It has been already demonstrated that seasonal climate predictions at European (or Iberian) scale from ensembles of global coupled climate models have some skill (Palmer et al., 2004). The limited predictability that exhibits the atmosphere in mid-latitudes, and therefore de Iberian Peninsula (PI), can be managed by a probabilistic approach based in terciles. This study presents an application for the IP of two methods for linking tercile-based seasonal climate forecasts with crop models to improve crop predictability.

Two methods were evaluated and applied for disaggregating seasonal rainfall forecasts into daily weather realizations: 1) a stochastic weather generator and 2) a forecast tercile resampler. Both methods were evaluated in a case study where the impacts of two seasonal rainfall forecasts (wet and dry forecast for 1998 and 2015 respectively) on rainfed wheat yield and irrigation requirements of maize in IP were analyzed. Simulated wheat yield and irrigation requirements of maize were computed with the crop models CERES-wheat and CERES-maize which are included in Decision Support System for Agrotechnology Transfer (DSSAT v.4.5, Hoogenboom et al., 2010). Simulations were run at several locations in Spain where the crop model was calibrated and validated with independent field data.

These methodologies would allow quantifying the benefits and risks of a seasonal climate forecast to potential users as farmers, agroindustry and insurance companies in the IP. Therefore, we would be able to establish early warning systems and to design crop management adaptation strategies that take advantage of favorable conditions or reduce the effect of adverse ones.

References

Palmer, T. et al., 2004. Development of a European multimodel ensemble system for seasonal-to-interannual prediction (DEMETER). Bulletin of the American Meteorological Society, 85(6): 853-872.